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(during development) variation of the organ in question. Furthermore, arguments are marshalled to prove the male animal is more variable than the female. We may suppose a division of labor has arisen, by which the male germ-cell has acquired the special function of storing up gemmules of this sort. The egg is the conservative hereditary factor in sexual conjugation, and the spermatozoon the progressive one. Facts are offered to show that in reciprocal crossing the male exerts a more variable influence than the female.

Die Bedeutung der sexuellen Fortpflanzung für die Selektionstheorie. WEISMANN. Jena, 1886.

This author objects to this theory on the ground that when animals are out of relation with their environment the special organ which is weak is not directly affected, and may even be in harmony with the other organs, (if one organ varies all must vary,) and hence will not feel any special strain. For example, what special strain can there be on the green of a moth's wing which does not match the color of a forest leaf, and thus exposes the moth to the attack of birds. His other objection, that the paternal character is as often masked by the prepotent maternal, due to the more rapid multiplication of the maternal idioplasm, does not seem to touch the point at issue. Weismann thinks that in asexual reproduction there can be no variation, and that variation ensues by the sexual union of idioplasms of diverse natures. Consider how multiform must be the variety of characters combined in each individual. The combinations for only ten generations amount to 1024. If now, slight variations in various directions ensue among the individuals of a species, when these variations are compounded the result must be, by algebraic summation, the continuous increase of special characters along definite lines in the course of several generations. But we ask, how can this be, except the minute variations are, in the majority of cases, in the right direction? Here is the very pith of the problem. There is also another factor left out of account, and that is the matter of sexual attraction, either between individuals or more especially between sexual pronuclei producing "prepotency." May there not be definite laws relating the structure of the two idioplasms about to be united, in a way most advantageous? Among human offspring the best and most beautiful offspring have been supposed the result of love matches, (Finck).

This opens up the whole question of the effect of the reproductive cells upon the soma, the reverse of the one we have been considering. The amount of nuclear material present is conceived as helping the process of self division, and when from any cause, as from lack of nutrition, the nucleoplasm is small, a stimulus to development is given by any sudden accession, as takes place in sexual conjugation of cells. This method, of occasional advantage to the protozoa, has been preserved with the metazoa, as it proved advantageous for producing variation, the protozoa not needing it for this purpose (?) as their body is directly changed by the environment. A further discussion of the question follows in the next paper, also by Weismann.

Die Continuität des Keimplasmas als Grundlage einer Theorie der Vererbung. WEISMANN. Jena, 1885.

Are we to conceive of ontogenetic development and reproduction as a repeated cycle starting with the egg, which produces an indefinite number of generations of cells called the soma; and then some of their ultimate generations becoming detached as eggs? Not at all. We must conceive, rather, that the germinal cells multiply like the protozoa, are immortal and direct descendants of each other, and that cyclically when reproduction takes place, some of the germinal cells divide on the plan

of successive differentiation, and produce the *soma* as an instrument for nourishing and maturing the remaining germ cells. As a matter of fact, in many animals the cells that are to become reproductive or ancestors of germ cells are early to be distinguished in the development, but we need not confine ourselves to this method, for *we get rid of the necessity of a continuity of germ cells by assuming a continuity of germinal plasm.* By germinal plasm is meant the true idioplasm which can differentiate into all the organs of the body. When once differentiated it has lost its generic character by analysis.

Weismann conceives ontogenetic development to be a series of successive simplifications of the idioplasm that is producing the soma, a successive analysis, as above noted, when speaking of ectoderm and entoderm. *But in any cell some idioplasm may remain undifferentiated*, while the remainder differentiates. There is differentiated plasma as well as undifferentiated, even in germinal cells; for the reproductive cells are tissues, and require "*oogenic*" and "*spermagenic*" plasma, just as the tissues in general require "*histogenic*" plasma. But when any cell which contains undifferentiated germ plasm is to take on itself the function of being reproductive, it must get rid of the histogenic plasm, and this is the significance of the polar globules extruded by eggs and the paranuclei found in spermatogenesis. Not till these bodies are formed will the pronuclei unite. Everywhere the process of extrusion of nuclear material is twice repeated, (the first globule itself also divides.) The first globule is supposed by Weismann to be the histogenic (*oogenic*) plasma, the second to be the equivalent of the spermatozoon. Strangely enough, Weismann later (*Ber. Natf. ges. Freiburg*, III, 1887,) discovered that parthenogenetic eggs (such can develop without fertilization) have only one polar globule. It would be interesting to know what takes place in the case of the queen bee, who fertilizes her eggs at will, the unfertilized ones hatching into males. To satisfy the theory these eggs should all extrude one globule, and then if fertilization takes place a second should be given off.

By saying that the second globule is the equivalent of the spermatozoon, Weismann does not think (like Minot and others) that there is one peculiar sort of idioplasm called "male" in the spermatozoon, and a "female" sort in the ovum, and that we can speak of "hermaphrodite cells." The cytoplasmic parts of germ cells have been differentiated to enable idioplasm essentially alike (as alike as are the male and female oyster) to reach each other and coalesce. In all cells that become reproductive, he would say some undifferentiated germ plasm was present, but in ordinary tissue cells produced by differentiated division he emphatically denies the possibility of such a thing. In this regard he opposes Kölliker.

Die Bedeutung der Zellen kerne für die Vorgänge der Vererbung. KÖLLIKER. Zeitsch. f. Wiss. Zool. Bd. 42.

This author conceives the idioplasm of all cells as similar, or in other words, all cells contain undifferentiated idioplasm; and there is no such thing as a differentiational cell division; not but that cells may start on different lines of development, but this is due, not to internal arrangements, but to external causes. It is, therefore, the action of the environment that determines the rôle of a cell. All cells are fundamentally like the germ cells. The problem is the same as that concerning latent characters; a certain environment has produced a definite result with any given sample of protoplasm; a different environment would have produced a different result. In each sex lies latent the character of the species, and the *sex* was determined during development by external causes. Of course, after differentiation has ensued it is practically impossible for involution and a new start in a different direction to